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Environmental Effects of the Application of Synthetic Urine to Feedlot Surfaces.


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Concentrated livestock feeding operations (CAFO) generate large quantities of manure in small areas. This manure is a potential source of excess nutrients, dust, ammonia, pathogens, odors, and other emissions that can adversely affect the environment and/or animal production. Significant quantities of feed N may be lost to the environment as ammonia, dinitrogen gas, or other compounds. European work indicates that under pasture conditions, cattle urine is the primary source of ammonia losses and feces is the primary source of methane and carbon dioxide losses. Our objective was to determine the microbial response to the application of synthetic urine (urea solution) or water to a beef cattle feedlot surface. Three treatments: 1) no application, 2) water only application, or 3) synthetic urine application were made to two soil-surfaced pens at the Bushland environmental research feedlot. Cattle were removed approximately 2 days before the study to allow any fresh urine to volatilize. The pen had a manure layer similar to a commercial feedyard (1-2 inches of loose manure on top of 1-4 inches of a dry hard pack of manure). The areas were sampled prior to application and again at 24, 48, 72, 96 and 192 hours after application. Culture dependent and independent methods were used to determine the response of selected microbial populations to the various treatments. Nonselective and selective media were employed. Community DNA samples were evaluated using DGGE-PCR methods employing 16S specific rDNA primers. An initial burst in the release of ammonia plus ammonium was observed indicating that a resident population of microorganisms was capable of rapidly metabolizing urea. Data from both culture dependent and independent methods indicated that microbial populations responded significantly to treatment with synthetic urine in a pen specific manner and that this response is different from the water and untreated controls.

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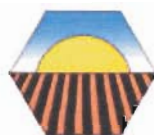
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